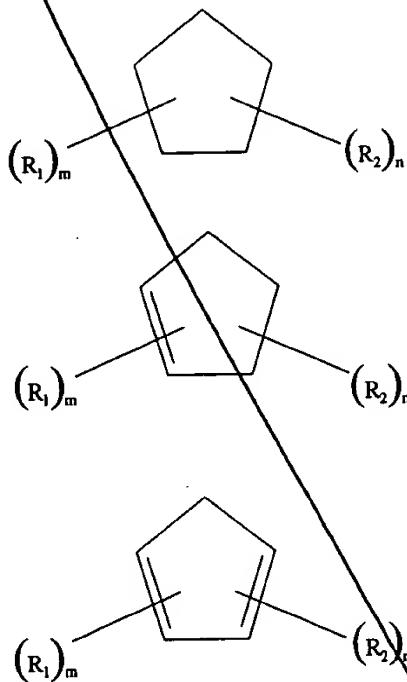


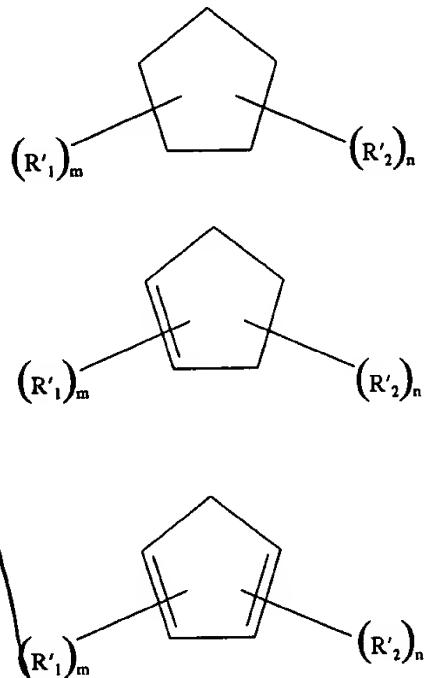
1 1. A magnetic recording medium, comprising:
2 a non-magnetic support;
3 a magnetic layer formed on the support; and
4 a lubricant layer over the magnetic layer, the lubricant layer including a compound
5 selected from the group consisting of hydrocarbyl-substituted cyclopentane, hydrocarbyl-
6 substituted cyclopentene, hydrocarbyl-substituted cyclopentadiene, and mixtures or
7 derivatives thereof.

2 2. The magnetic recording medium of claim 1, wherein the lubricant layer includes a
hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, or a
hydrocarbyl-substituted cyclopentadiene as represented by the following respective formulas:

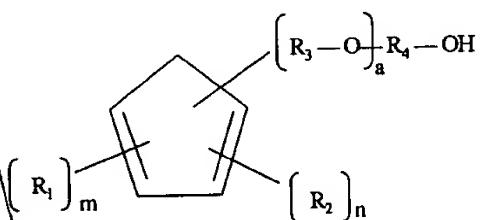
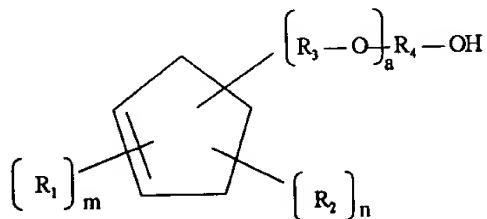
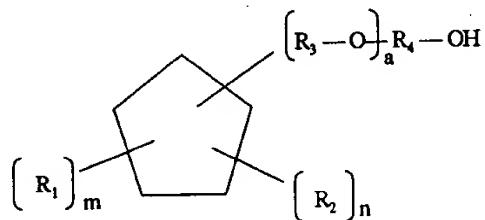


4 wherein R_1 and R_2 are respectively a hydrocarbyl group, and m and n are respectively zero
5 or a positive integer.

1
2
3 3. The magnetic recording medium of claim 1, wherein the lubricant layer includes a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, or a hydrocarbyl-substituted cyclopentadiene as represented by the following respective formulas:

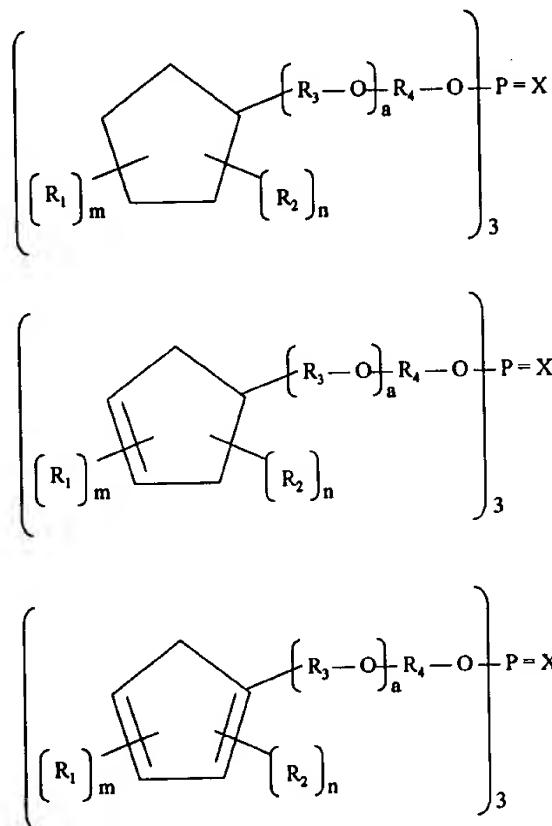


1 5. The magnetic recording medium of claim 4, wherein the derivatives of the
2 hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-
3 substituted cyclopentadiene are represented by the following respective formulas:



4 wherein a is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer;
5 R₁, R₂, R₃, and R₄ are individually a hydrocarbyl group.

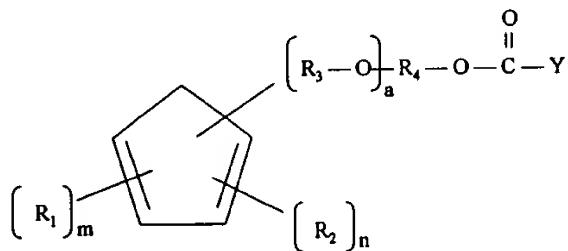
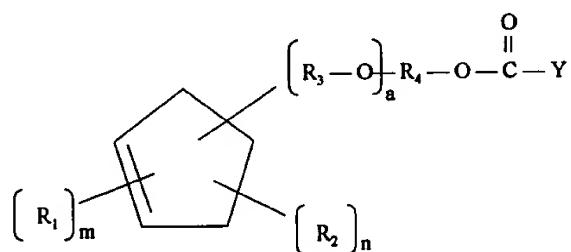
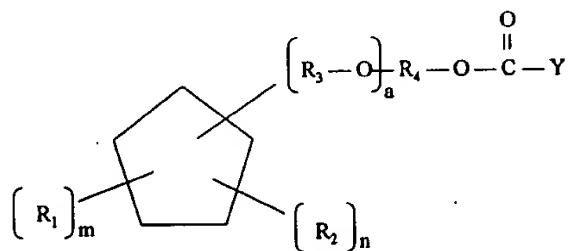
1 6. The magnetic recording medium of claim 4, wherein the derivatives of the
2 hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-
3 substituted cyclopentadiene are represented by the following respective formulas:



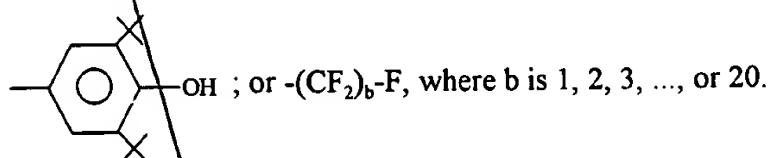
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4 wherein a is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer;
5 R₁, R₂, R₃, and R₄ are individually a hydrocarbyl group; X is either oxygen or sulfur.

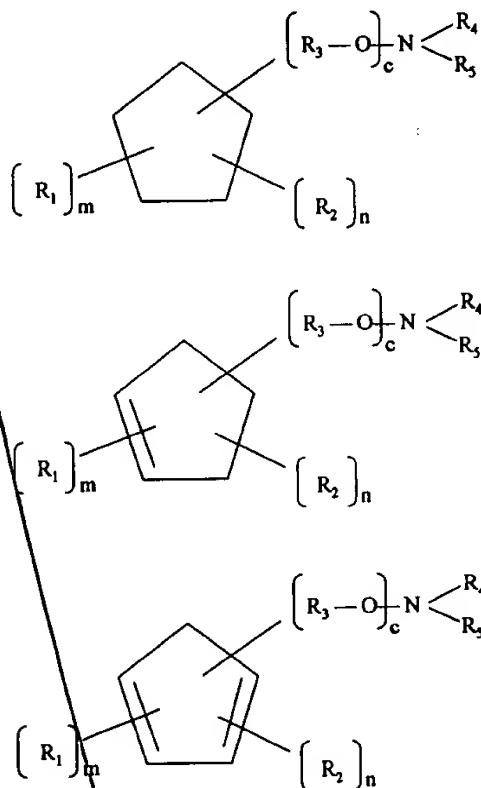
1 7. The magnetic recording medium of claim 4, wherein the derivatives of the
2 hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-
3 substituted cyclopentadiene are represented by the following respective formulas:



4 wherein a is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer;
5 R_1 , R_2 , R_3 , and R_4 are individually a hydrocarbyl group; Y is -OH; -NH₂,

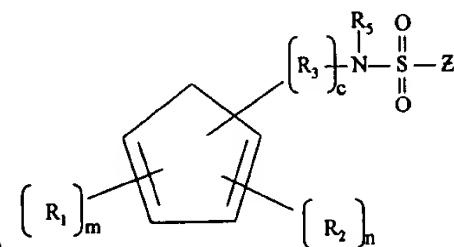
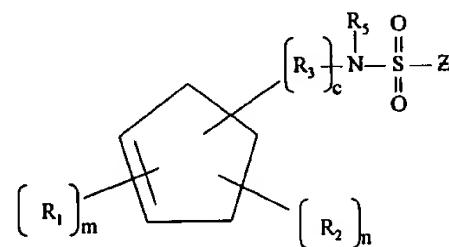
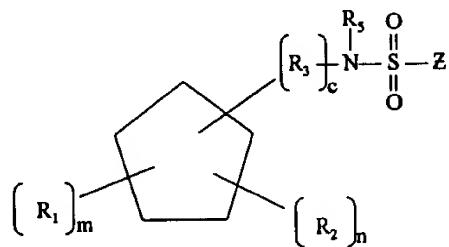


1 8. The magnetic recording medium of claim 4, wherein the derivatives of the
2 hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-
3 substituted cyclopentadiene are represented by the following respective formulas:



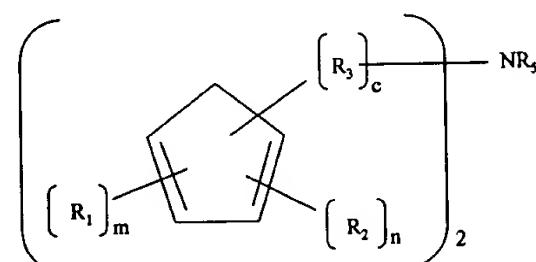
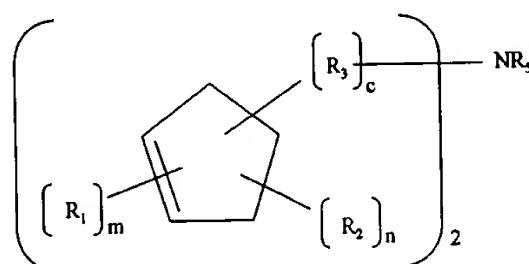
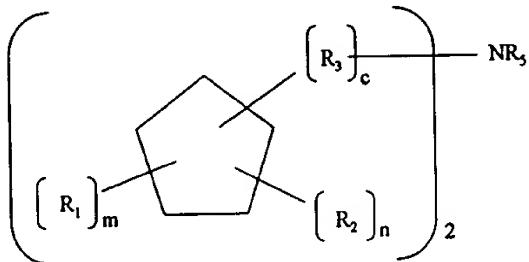
4 wherein c is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer;
5 R_1, R_2 , and R_3 are individually a hydrocarbyl group; R_4 and R_5 individually are hydrogen or
6 hydrocarbyl.

1 9. The magnetic recording medium of claim 4, wherein the derivatives of the
2 hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-
3 substituted cyclopentadiene are represented by the following respective formulas:



4 wherein c is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer;
5 R₁, R₂, and R₃ are individually a hydrocarbyl group; R₅ is hydrogen or hydrocarbyl; Z is
6 hydrocarbyl or -(CF₂)_b-F where b is 1, 2, 3, ..., or 20.

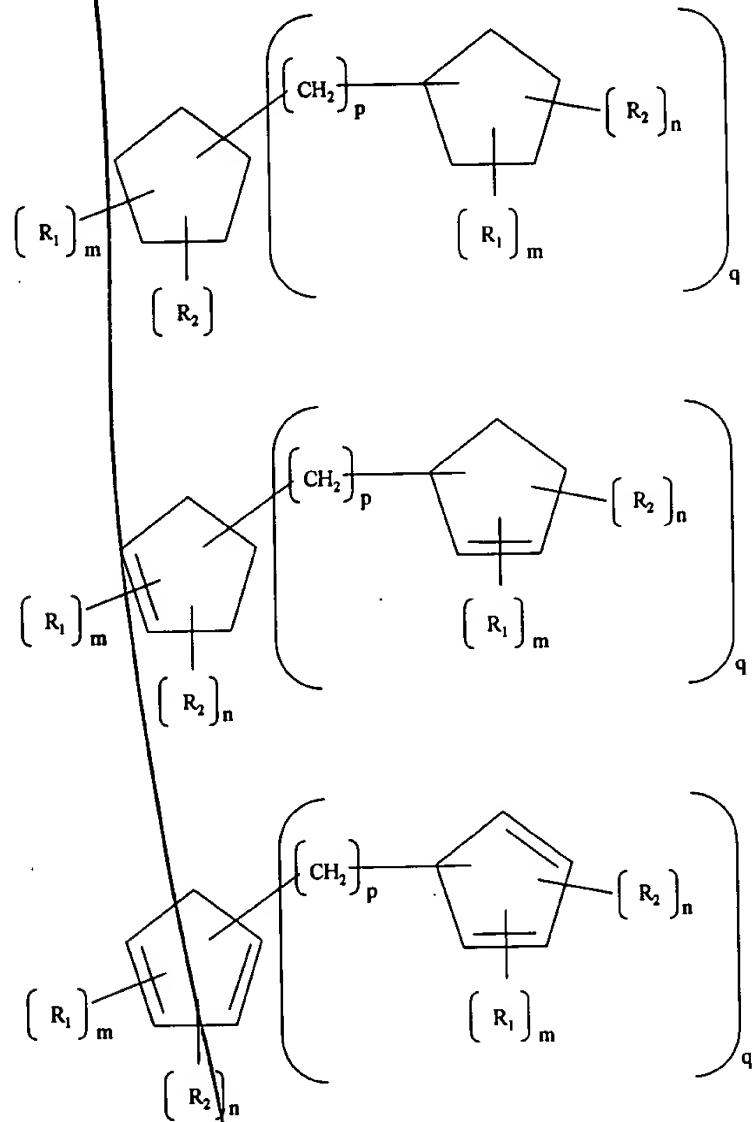
1 10. The magnetic recording medium of claim 4, wherein the derivatives of the
2 hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-
3 substituted cyclopentadiene are represented by the following respective formulas:



4 wherein c is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer;
5 R₁, R₂, and R₃ are individually a hydrocarbyl group; R₅ is hydrogen or hydrocarbyl.

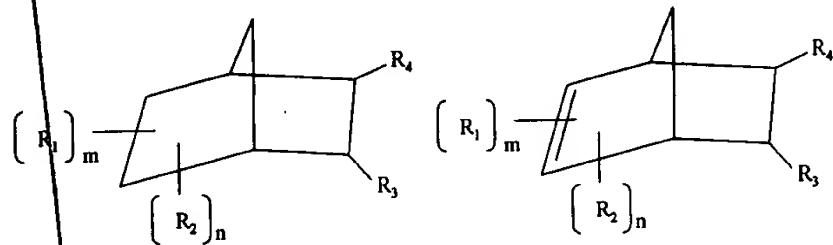
1 11. The magnetic recording medium of claim 4, wherein the derivatives of the
2 hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-
3 substituted cyclopentadiene are represented by the following respective formulas:

*John B. Zell
Catalyst*



4 wherein p is 1, 2, 3, ..., or 10; q is 1, 2, 3, ..., or 10; m and n are zero or a positive
5 integer; R₁ and R₂ are individually a hydrocarbyl group.

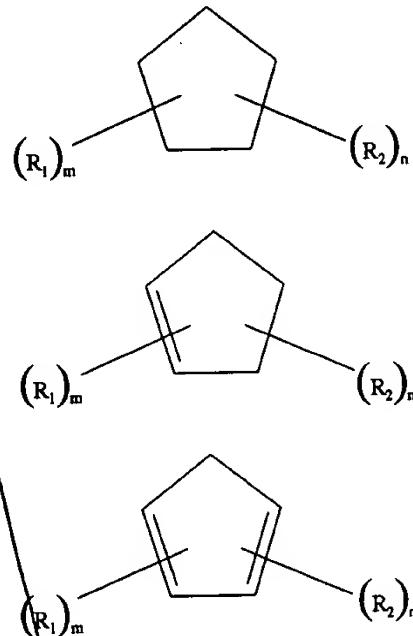
1 12. The magnetic recording medium of claim 4, wherein the derivatives of the
2 hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-
3 substituted cyclopentadiene are represented by the following respective formulas:



4 wherein m and n are zero or a positive integers; R_1 and R_2 individually are a
5 hydrocarbyl group; R_3 and R_4 individually are hydrocarbyl, hydroxy, nitrile, carboxylic acid,
6 carboxylic amide, or carboxylic ester.

1 13. The magnetic recording medium of claim 1, further comprising:
2 a protective layer between the magnetic layer and the lubricant layer.

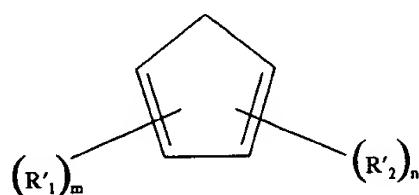
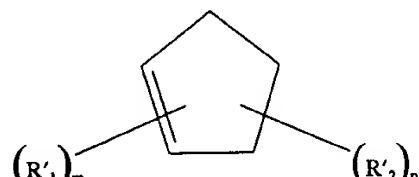
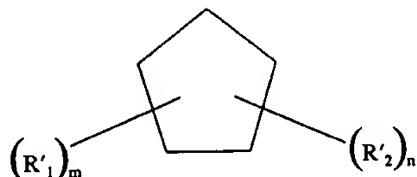
1 14. The magnetic recording medium of claim 13, wherein the lubricant layer includes a
2 hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, or a
3 hydrocarbyl-substituted cyclopentadiene as represented by the following respective formulas:



4 wherein R_1 and R_2 are respectively a hydrocarbyl group, and m and n are respectively
5 zero or a positive integer.

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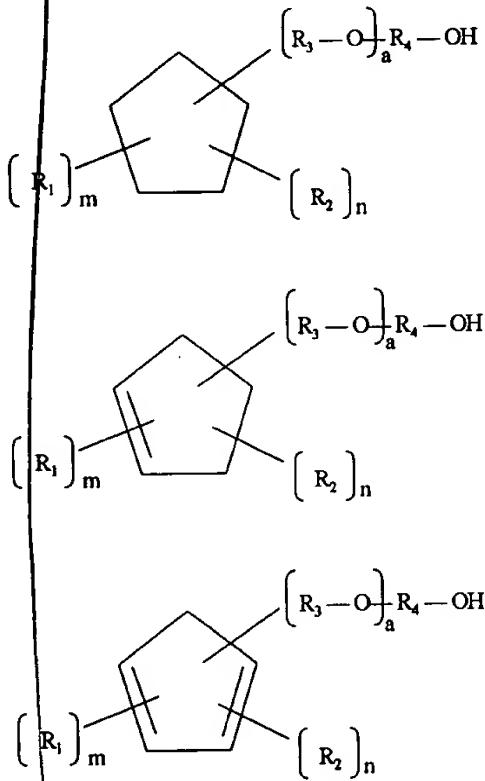
1 15. The magnetic recording medium of claim 13, wherein the lubricant layer includes a
2 hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, or a
3 hydrocarbyl-substituted cyclopentadiene as represented by the following respective formulas:



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6
7 wherein R'1 and R'2 are respectively a functionalized hydrocarbyl group which
includes a functional group selected from -OH; -NH₂; carboxylic acid; carboxylic ester;
phenolic ester; polyether; amide; amine; sulfonamide; thiophosphate; and phosphate, and m
and n are respectively zero or a positive integer.

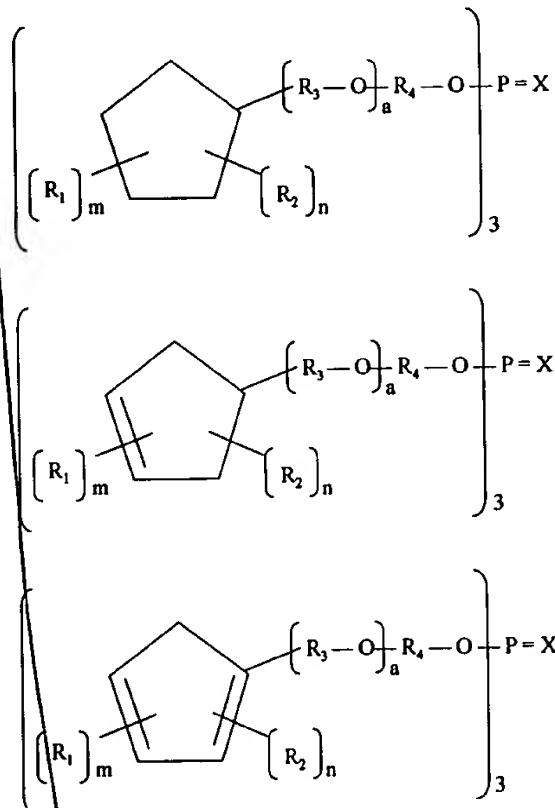
1 16. The magnetic recording medium of claim 13, wherein the derivatives of the
2 hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-
3 substituted cyclopentadiene include at least one functional group selected from the group
4 consisting of hydroxy, carboxylic acid, amine, carboxylic ester, carboxylic amide, phosphate,
5 and sulfur-containing groups.

1 17. The magnetic recording medium of claim 16, wherein the derivatives of the
2 hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-
3 substituted cyclopentadiene are represented by the following respective formulas:



4 wherein a is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer;
5 R_1 , R_2 , R_3 , and R_4 are individually a hydrocarbyl group.

1 18. The magnetic recording medium of claim 16, wherein the derivatives of the
2 hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-
3 substituted cyclopentadiene are represented by the following respective formulas:



4 wherein a is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer;
5 R₁, R₂, R₃, and R₄ are individually a hydrocarbyl group; X is either oxygen or sulfur.

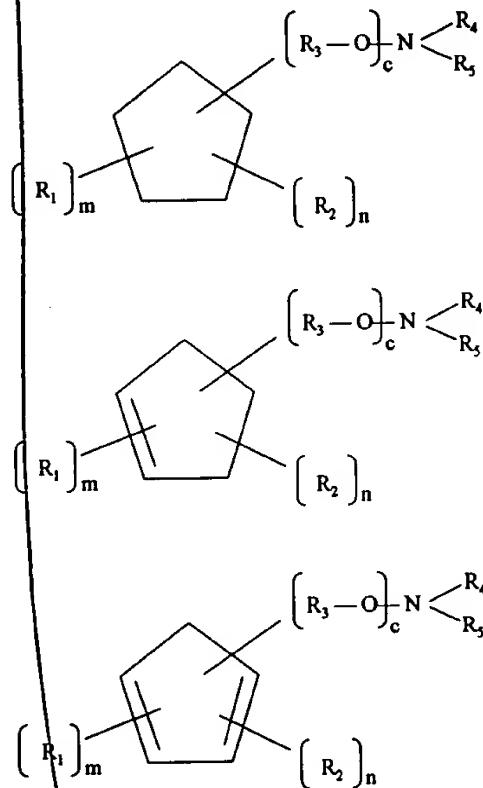
1 19. The magnetic recording medium of claim 16, wherein the derivatives of the
2 hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-
3 substituted cyclopentadiene are represented by the following respective formulas:

$$\begin{array}{c}
 \text{O} \\
 \parallel \\
 \text{R}_3 - \text{O} \Big)_{\text{a}} \text{R}_4 - \text{O} - \text{C} - \text{Y} \\
 | \\
 \text{R}_1 \\
 | \\
 \text{R}_2 \\
 | \\
 \text{R}_1
 \end{array}$$

4 wherein a is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer;
5 R_1 , R_2 , R_3 , and R_4 are individually a hydrocarbyl group; Y is -OH; -NH₂,

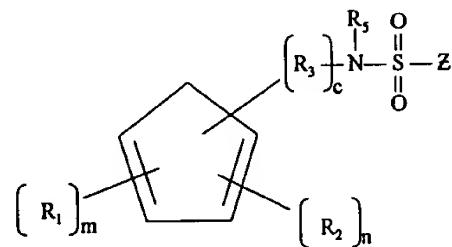
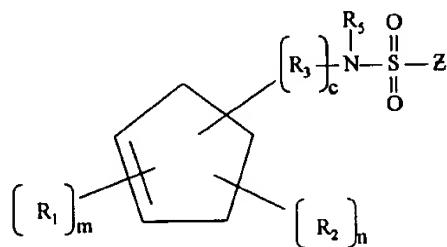
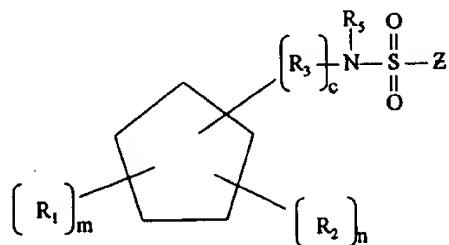
6  -OH ; or $-(CF_2)_b-F$, where b is 1, 2, 3, ..., or 20.

1 20. The magnetic recording medium of claim 16, wherein the derivatives of the
2 hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-
3 substituted cyclopentadiene are represented by the following respective formulas:



4 wherein c is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer;
5 R_1 , R_2 , and R_3 are individually a hydrocarbyl group; R_4 and R_5 individually are hydrogen or
6 hydrocarbyl.

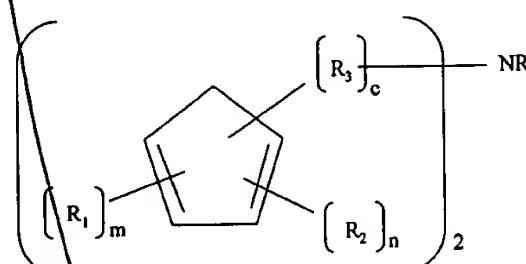
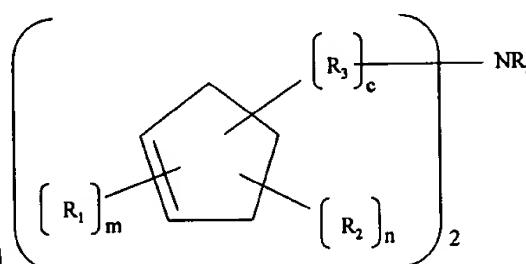
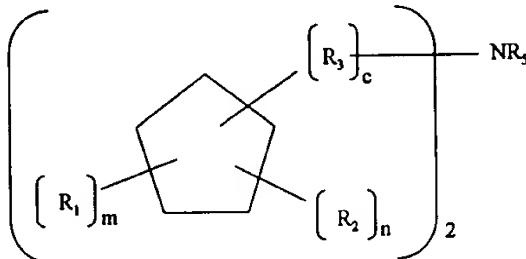
1 21. The magnetic recording medium of claim 16, wherein the derivatives of the
2 hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-
3 substituted cyclopentadiene are represented by the following respective formulas:



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4 wherein c is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer;
5 R₁, R₂, and R₃ are individually a hydrocarbyl group; R₅ is hydrogen or hydrocarbyl; Z is
6 hydrocarbyl or -(CF₂)_b-F where b is 1, 2, 3, ..., or 20.

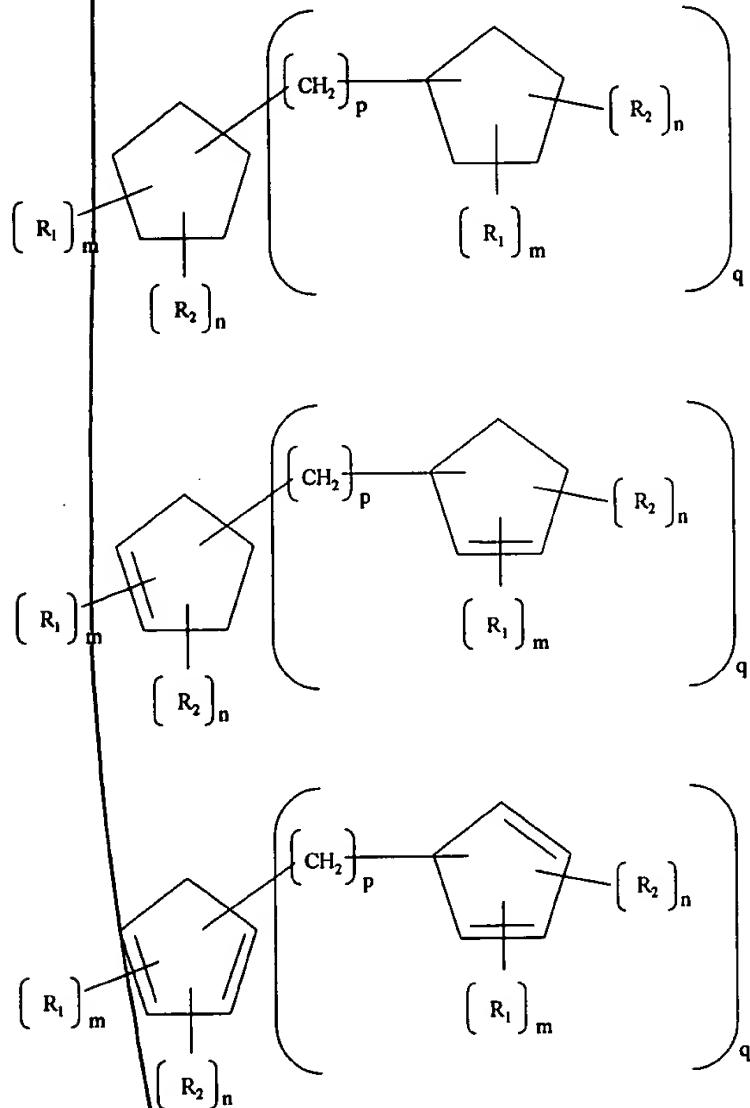
1 22. The magnetic recording medium of claim 16, wherein the derivatives of the
2 hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-
3 substituted cyclopentadiene are represented by the following respective formulas:



4 wherein c is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer;
5 R₁, R₂, and R₃ are individually a hydrocarbyl group; R₃ is hydrogen or hydrocarbyl.

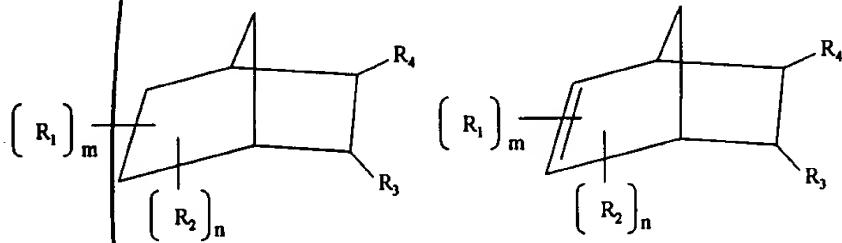
1 23. The magnetic recording medium of claim 16, wherein the derivatives of the
2 hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-
3 substituted cyclopentadiene are represented by the following respective formulas:

*Sue
Boz
Conley*



4 wherein p is 1, 2, 3, ..., or 10; q is 1, 2, 3, ..., or 10; m and n are zero or a positive
5 integer; R_1 and R_2 are individually a hydrocarbyl group.

1 24. The magnetic recording medium of claim 16, wherein the derivatives of the
2 hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-
3 substituted cyclopentadiene are represented by the following respective formulas:



4 wherein m and n are zero or a positive integers; R_1 and R_2 individually are a
5 hydrocarbyl group; R_3 and R_4 individually are hydrocarbyl, hydroxy, nitrile, carboxylic acid,
6 carboxylic amide, or carboxylic ester.

10 25. A magnetic head, comprising:

11 a head; and

12 a lubricant layer over at least a portion of the head, the lubricant layer including a
13 compound selected from the group consisting of hydrocarbyl substituted cyclopentane,
14 hydrocarbyl substituted cyclopentene, hydrocarbyl substituted cyclopentadiene, and mixtures
15 or derivatives thereof.

16 26. A data storage/retrieval device, comprising:

17 a magnetic recording medium including a magnetic layer over a support and a
18 lubricant layer over the magnetic layer, the lubricant layer including a compound selected
19 from the group consisting of hydrocarbyl substituted cyclopentane, hydrocarbyl substituted
20 cyclopentene, hydrocarbyl substituted cyclopentadiene, and mixtures or derivatives thereof;
21 and

22 a magnetic head adjacent to the magnetic recording medium, the magnetic head sliding
23 on the magnetic recording medium to read and write information on the magnetic recording
24 medium.

1 27. The data storage/retrieval device of claim 26, further comprising:
2 a power supply for applying a voltage across the magnetic recording medium and the
3 magnetic head for reading or writing information on the magnetic recording medium.

1 28. The data storage/retrieval device of claim 26, wherein the device is a computer disk
2 drive.

1 29. A computer, comprising:
2 a CPU;
3 a disk drive connected to the CPU so that the disk drive can communicate with the
4 CPU, the disk drive including:
5 a magnetic recording medium having a magnetic layer over a support and a lubricant
6 layer over the magnetic layer, the lubricant layer having a compound selected from the group
7 consisting of hydrocarbyl substituted cyclopentane, hydrocarbyl substituted cyclopentene,
8 hydrocarbyl substituted cyclopentadiene, and mixtures or derivatives thereof; and
9 a magnetic head adjacent to the magnetic recording medium, the magnetic head sliding
10 on the magnetic recording medium to read and write information on the magnetic recording
11 medium.

1 30. A method of manufacturing a magnetic recording medium, comprising:
2 providing a non-magnetic support;
3 forming a magnetic layer on the support; and
4 forming a lubricant layer over the magnetic layer, the lubricant layer including a
5 compound selected from the group consisting of hydrocarbyl substituted cyclopentane,
6 hydrocarbyl substituted cyclopentene, hydrocarbyl substituted cyclopentadiene, and mixtures
7 or derivatives thereof.

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31. The method of claim 30, further comprising:
forming a protective layer on the magnetic layer between the lubricant layer and the
magnetic layer.

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